C L A I M S

1. A method for maintaining and/or qualitatively improving a communication path in a relay system, wherein information is transmissible between two devices (A_0, A_n) via one or more additional devices (A_1,..., A_{n-1}) along the thereby formed communication path, and wherein at least one leg of the communication path is replaceable with a substitute path as a function of at least one predeterminable parameter, or usable at least at times simultaneously with a substitute path.

2. The method of claim 1, wherein a connection identifier is assigned to the connection that is defined or produced between the two devices (A_0, A_n).

3. The method of claim 2, wherein the connection identifier comprises an unambiguous identity of A_0 in the relay system at a predeterminable time and a provisional temporary identifier which is selected by A_0.

4. The method of claim 1, wherein each change of a path is communicated to A_0 and/or A_n by the relays and/or end devices that participate in the path change.

5. The method of claim 1, wherein a path identifier is assigned to the path, which is unambiguous at a given time, and takes account of each change in the path.

6. The method of claim 1, wherein a device identifier for each information exchange via the path

is assigned to at least one device A_i (i = 0, ...n) that participates in the path.

7. The method of claim 6, wherein the device identifier comprises the path identifier and the position i in the path.

8. The method of claim 2, wherein the connection identifier and/or the temporary identifier and/or the path identifier and/or the device identifier is or are assigned by A_0 and/or A_n.

9. The method of claim 1, wherein each device exchanges with its adjacent relay information, preferably the identifiers of existing connections and/or paths and/or the position i in the path of neighbors of a predeterminable order.

10. The method of claim 9, wherein the exchange of information occurs periodically.

11. The method of claim 1, wherein a device A_1 designates an adjacent relay D of the first order as substitution candidate, when the adjacent relay D is an adjacent relay of the first order of A_i for a predeterminable time and belongs to the same connection and/or same path, but is neither A_{i-1} nor A_{i+1}, and that a link quality between the device A_i and the adjacent relay D has or exceeds a predeterminable quality.

12. The method of claim 1, wherein each device participating in the path transmits via the path at least one of its identities to all other devices of the

path or to the nearest K devices in both directions of the path.

13. The method of claim 1, wherein each device transmits the same identity to its neighbors of the first or a predeterminable higher order.

14. The method of claim 13, wherein the identity is device-specific and/or subscriber-specific.

15. The method of claim 1, wherein the value K is predeterminable.

16. The method of claim 15, wherein the value K is at least temporarily reducible, when a signaling load exceeds a predeterminable value.

17. The method of claim 5, wherein a relay participating in a path transmits the path identifier P and the position i in the path to its adjacent relays of the first order.

18. The method of claim 1, wherein in the relay system information is communicated via a device in the path to as far as lth neighbors of devices of the path, so that a device that is an mth neighbor of a device in the path ($m \leq l$) knows at least one neighbor of the (m-1)th order of the device in the path.

19. The method of claim 5, wherein a device A_1, which occupies the position i in a loopfree path with the path identifier P, designates an adjacent relay D a substitution candidate, when this adjacent relay D knows as adjacent relay of the lth order, a relay that

occupies in the path with the path identifier P the position k in the path, and when the adjacent relay D is an adjacent relay of the first order of A_i for a predeterminable time, and when preferably a link quality between the device A_1 and the adjacent relay D has or exceeds a predeterminable quality.

20. The method of claim 1, wherein devices or relays exchange adjacency information with their adjacent relays of the first order via their adjacent relays of the 1th order.

21. The method of claim 20, wherein the adjacency information comprises the identity and the order of the adjacency.

22. The method of claim 20, wherein each device participating in the path transmits via the path the adjacency information to all other devices of the path or to the nearest K devices in both directions of the path.

23. The method of claim 5, wherein an adjacent relay of the first order is designated a substitution candidate, when the adjacent relay is simultaneously known to a relay occupying the position k in the path with the path identifier P as an adjacent relay of an order smaller than 1.

24. The method of claim 23, wherein the value 1 and/or K is predeterminable.

25. The method of claim 24, wherein the value l and/or K is at least temporarily reducible, when a signaling load exceeds a predeterminable value.

26. The method of claim 1, wherein for examining whether a link between two devices or relays is disturbed or interrupted or is assumed to be disturbed or interrupted, a link diagnosis and/or link signaling is performed.

27. The method of claim 1, wherein the quality and/or the quality of service of the path or leg thereof is rated.

28. The method of claim 1, wherein a device A_1 performs a local substitution of a leg of the path or enables a simultaneous usability of a substitution path, when the link to A_j(j=i-1 or i+1) is interrupted or greatly disturbed and/or threatens to be interrupted or greatly disturbed, and when A_i knows one or more substitution candidates.

29. The method of claim 1, wherein a device A_i performs a local substitution of a leg of the path, or enables a simultaneous usability of a substitution path, when according to the data known to A_j an existing leg of the path that proceeds from A_j can be replaced with a new leg of a shorter length that passes through a substitution candidate R.

30. The method of claim 1, wherein a local substitution is initiated by requesting the substitution candidate to further establish the new leg of the path.

31. The method of claim 30, wherein the request is forwarded by the substitution candidate to further suitable relays.

32. The method of claim 1, wherein a device A_i (i=0 or n) performs a global substitution, when the quality of the path from A_i to A_j (j=0 or j=n; j≠i) or A_{i-1} (i>0) falls below a predeterminable quality.

33. The method of claim 1, wherein the substitution candidate performs a global substitution by establishing a path between A_0 and A_n according to a nondeterministic method of establishing a path and/or a method that takes into account the network status or the status of the relay system, so that in all likelihood the substitution path differs from the original path.

34. The method of claim 11, wherein the substitution candidate performs a global substitution by establishing a path between A_i and A_j according to a nondeterministic method of establishing a path and/or a method that takes into account the network status or the status of the relay system, so that in all likelihood the substitution path differs from the original path.

35. The method of claim 34, wherein in the case of a local or a global substitution, a signaling connection is initially established.

36. The method of claim 1, wherein in the case of the global substitution, a service connection uses both

or several paths, the original and the new path or the new paths, until the original path or one of the new paths exceeds a quality threshold value.

37. The method of claim 36, wherein after exceeding the quality threshold value, less suited paths are disconnected.

38. The method of claim 1, wherein the user information that is to be transmitted can be buffered at the respective destination.

39. The method of claim 1, wherein it is determined during the establishment of a path or during a communication connection, which relay or relays is or are authorized to perform a substitution.

40. The method of claim 1, wherein the device or relay nearest to a source or a destination is authorized to perform a substitution.

41. The method of claim 1, wherein with respect to disconnecting no longer needed paths or legs thereof, packet comparisons occur, and/or a test packet is used, and/or the position of the substitution candidate in the path is communicated to A_i.

42. The method of claim 41, wherein a substitution is performed as a function of the application.

43. The method of claim 42, wherein it is possible to use different transmission technologies between the individual devices or relays.

ABSTRACT

A method for maintaining and/or qualitatively improving a communication path in a relay system, in particular in a radio network, wherein information is transmissible between two devices (A_0, A_n) via one or more additional devices (A_1, ..., A_{n-1}) along a thus-formed communication path, and wherein at least one leg of the communication path can be replaced with a substitution path as a function of at least one predeterminable parameter, or be used at least at times simultaneously with a substitution path. The method permits maintaining a link quality at a high level, even when transmission conditions vary in the course of time.

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